plifier 70, the amplitude of said pulse being proportional to the width of the drop, as previously explained. A recycling pulse is provided by the third delay circuit 36 which provides an output pulse, having a delay period of T6 minus T1, to the relay 128 to close the contacts 130—132 thereof for shorting the peak detector 66, as indicated at 69 on the wave form 68. In addition to shorting the output of the peak detector 66, the closed contacts short the input to the cubing amplifier 70, causing output to the servo amplifier to be cut off to unbalance the bridge constituted by resistors 90, 92 and 98, and the servo motor 104 operates in the opposite direction to return to its zero position. However, due to the unidirectional coupler 112, said opposite rotation of the shaft 108 does not result in a count being recorded on the counter 114.

The closing of the relay contacts 116 and 118 is utilized to remove the filled container 86, which now has a predetermined volume of the liquid, from under the outlet 12 and to replace the container 86 with another container preferably utilizing the fraction collector apparatus disclosed in the previously identified Patent No. 2,710,715, and generally indicated herein by the reference numeral 156. More specifically, in said prior patent, provision is made to periodically energize a rack moving motor 288 under the control of a counting device, the schematic wiring diagram of which is indicated by the reference numeral 592 in Fig. 31 of said patent. As illustrated in Fig. 1A the rack 289 is rotated intermittently by the engagement of pin 291 with the toothed edge 293 of the rack as described in said Patent No. 2,710,715. Pin 291 is rotated by the shaft 295 of motor 288 through the gearing 297. In accordance with the present invention the drop volume measuring apparatus 10 is utilized in lieu of the drop counting device 592 of said patent to provide a predetermined volume of liquid in each of the containers 86. The circuitry utilized in connecting the drop volume measuring apparatus 10 of the present invention to the main control unit 562 of the automatic fraction collection apparatus, as shown in Fig. 31, includes the relay coil 134 one end of which is connected to contact 118 through an RC network constituted by the capacitor 136 and a resistor 138. The other end of the relay 134 is grounded. When the counter 114 reaches a predetermined count, as explained above, the contacts 116 and 118 close and the RC network 136—136 is charged by the potential source to provide a positive potential for energizing the relay 134. The latter is provided with a movable contact 140 and a companion stationary contact 142. The movable contact 140 is connected to one end of a relay coil 144 and to a stationary contact 146 of said coil.

The terminal strip 598 of said prior patent is illustrated by the similarly numbered terminal strip herein and the various terminals shown herein and parts extending to the right of said terminals represent the correspondingly or similarly numbered parts or components of the fraction collector apparatus 156 of said prior patent. The stationary contact 142 is connected to the terminal 608 of said terminal strip 598 and the other end of the relay 144 is connected through the lead 148 to the terminal 606. The movable contact 150 of said relay 144, companion to the stationary contact 146 thereof, is connected to the terminal 612. A second movable contact 152 of said relay is connected to the terminal 614 and a stationary contact 154, companion to said contact 152, is connected to the terminal 608. With the control switch 580 of the automatic fraction collection apparatus 156 in the illustrated condition thereof to provide an equally measured volume of liquid in each container 86, the contact 142 of relay 134 is connected through the terminal 608 and closed switch section 508B to one power terminal 564, the relay 144 being connected through the line 148, the terminal 606 and the closed switch section 508A to the other power terminal 572. The unit motor 288, which is intermittently operated to intermittently rotate the container holding rack of the automatic fraction collection apparatus 156, is connected between the terminal 614 and the power terminal 572. The reset switch 364, of the automatic fraction collection apparatus, is connected between the terminals 608 and 612.

Assuming now that a predetermined count has been reached by the counter 114, the contacts 116, 118 thereof will close to charge the RC network 136—138 to energize the relay 134. This closes the contacts 140—142 thereof and completes a circuit between one side of the relay 144 and the power terminal 564, the other side of relay 144 being connected to the power terminal 572. Energization of the relay 144 results in the closing of the contacts 146—150 thereof to provide a holding circuit for retaining said relay 144 in energized condition after the de-energization of the relay 134 due to the decrease in charging current through capacitor 136. It will be noted that the holding circuit for the relay 144 includes the closed reset switch 364. Energization of the relay 144 also closes its contacts 152—154 to complete the energizing circuit for the motor 288 through the contacts 152—154 to the power terminal 564. The motor now operates to rotate its rack to move the filled receptacle or container 86 from beneath the outlet 12 and to replace the filled container with an empty container positioned under said outlet, as fully illustrated and described in said patent. Shortly before the motor has completed its movement, the reset switch 364 is operated by a cam driven by the motor, as fully illustrated and described in said patent, to open the switch 364 for interrupting the holding circuit of the relay 144 to de-energize the latter and to open the paired contacts thereof.

Consequently, it will be readily apparent that the apparatus 10 may be utilized to provide an equally measured volume of liquid in each container 86 of the fraction collector 156, to provide a highly accurate equal volume or fraction of the liquid in each receptacle or container of the fraction collector.

While I have shown and described the preferred embodiments of my invention, it will be understood that various changes may be made in the idea or principles of the invention within the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. Apparatus for measuring the volume of one or more falling drops of liquid comprising means for providing a falling drop of the liquid, means operable in response to the fall of the drop in relation thereto to provide a voltage proportional to the width of a drop, means to cube said voltage, and means to measure said cubed voltage whereby to provide a measurement proportional to said volume.

2. Apparatus for measuring the volume of a drop of liquid comprising means to provide a voltage proportional to the width of said drop, means for directing a series of liquid drops in succession in operative relation to said voltage providing means for controlling the operation of the latter for generating the voltage, means to cube said voltage, and means to measure said cubed voltage whereby to provide a measurement proportional to said volume, said measuring means comprising means to provide a count proportional to said cubed voltage, means to receive one or more drops of the liquid, and means operable under the control of said measuring means for controlling the volume of liquid delivered to said receiving means.

3. Apparatus for measuring the volume of one or more drops of liquid comprising means to provide a voltage proportional to the width of a drop, means for directing a series of liquid drops in succession in operative relation to said voltage providing means for controlling the operation of the latter for generating the voltage, means to cube said voltage, and means to measure said cubed voltage whereby to provide a measurement proportional to said volume, said measuring means comprising a servo system